

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Orthopaedic Apparatus for Human Spine Traction

I, GIOVANNI ZUMAGLINI, an Italian citizen, trading as OFFICINA MEDICO-ORTOPEDICA DOTT. GIOVANNI ZUMAGLINI, of 45 bis, Corso Filippo Turati, Turin, Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

- 10 The invention relates to orthopaedic apparatus for effecting traction of the spine of a human patient.

Such an apparatus is used whenever an ambulatory traction of the spine is required, such as in the treatment of cyphosis, cyphoscoliosis, rarefying or condensing osteitis and sequela thereof, somatic and disk arthrosic processes, diskopathy, specific and inflammatory processes of the spine, fractures, dislocations, spondylolysis, and spondylolisthesis.

Known apparatus of the above mentioned type generally comprises a pelvic girdle with an anatomically shaped truss which is adapted to bear on the bony projections of the pelvis and a metallic tractor structure having, at its top end, two rests for the chin and occipital head regions respectively. Traction is generally effected by the tightening of suitable screw means or by the engagement of pegs in a spaced sequence of notches so as gradually to urge the said head rests away from the pelvic girdle.

Such an apparatus also comprises one or more extended members which extend up the patient's back and one or more such members which extend up the patient's chest.

As a result of this general structure, such an apparatus is uncomfortable for the patient because it is capable of only course adjustment and will prevent natural movements of the patient's head. It is a primary

object of the present invention at least substantially to obviate the above discomfort by providing an orthopaedic apparatus for traction of the human spine which apparatus can be worn under any circumstances, which may be finely adjusted and which will conveniently permit of his walking.

Thus, according to the present invention there is provided an orthopaedic apparatus for effecting traction of a human spine, comprising the combination of a pelvic girdle, anatomically shaped to bear on the body projections of the pelvis of a patient, and a tractor structure, the said tractor structure comprising two shaped members which extend over and up the patient's back to carry a head-supporting structure, pneumatic means being provided and arranged to tension the tractor structure between the patient's pelvic girdle and the chin and occipital regions of the patient's head.

A further object of the invention is to provide an apparatus of the abovementioned type which will allow flexo-extension as well as rotation of the patient's head and will be thus even more comfortable for a patient to wear while effecting an efficient continuous traction of the spine whatever the position of the body.

Thus, advantageously, the head supporting structure is articulated about a horizontal axis and the head supporting structure is articulated about a vertical axis.

In order that the invention may be more readily understood, reference will now be made to the accompanying drawings which are given by way of example and in which:

Fig. 1 is a perspective view of an orthopaedic apparatus according to the invention;

Fig. 2 is a perspective view of a detail of Fig. 1, the detail relating to the head

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supporting structure;

Fig. 3 is a cross sectional view taken along line III-III of Fig. 2; and

Fig. 4 is an exploded perspective view of a detail relating to a means which enables rotation of the patient's head about a vertical axis and which is a preferred feature of the present invention.

The illustrated orthopaedic apparatus according to the invention essentially comprises a pelvic girdle 1 which is moulded from plastics and is anatomically shaped to fit a patient's body. The girdle 1 is open at its front for fitting to the patient and is provided at its back with two upper cylindrical guides 3 and two lower cylindrical guides 4. The apparatus also comprises a tractor structure 2 formed from two extended members 201 and 200, the lower parts of which are in the form of two parallel lower rod parts 2a, 2b and which are arranged to slide, each in a pair of superposed guides 3, 4.

The said tractor structure 2 is generally shaped to follow the contours of the patient's back, the upper parts of the said two extended members 201, 200 being respectively in the form of upper rod parts 2c, 2d. In use the latter said parts 2c, 2d each extend to one side of the patient's neck and together carry a structure 10 which serves to support the patient's head.

The upper rod parts 2c, 2d of the members 201, 200 of the structure 2 each carry a strap 8 (see especially Fig. 2) which straps provide the means for articulation of the head supporting structure 10 about bolts 9 and a substantially horizontal axis X-X (Fig. 2). The said structure 10 comprises a shaped plate 11 and a further shaped plate 12 on which plates the occipital bone and the chin of the patient rest respectively after fitting of the apparatus to the patient.

As will be best seen from Figs. 2 and 3, the head supporting structure 10 is constructed in two demountable halves 10a, 10b which are interconnectable along the axis of articulation X-X, such interconnection being by means of joints 10c provided with set screws. This arrangement facilitates assembly of the structure on the patient.

As shown in Fig. 1, the parallel rod parts 2a, 2b of the two members 201, 200 of the structure 2 are interconnected by a cross member 5 into which an operating screw 6 is screwed. This latter screw bears on a bottom support 7 which is fast with the girdle 1 and which serves to afford a preliminary coarse adjustment of the apparatus.

In accordance with the invention, two pneumatic cushions 13, 14 are arranged on the plates 11, 12 respectively. Each said cushion comprises an air chamber which is

connected by a pipe 15, 16 respectively to a pump device, for instance a device of the sphygmomanometer type, from which air under pressure is supplied to the cushions. The latter device preferably comprises a ball pump 17 and pressure gauge 18, as well as valve means for closing the air chambers to the atmosphere.

The apparatus according to the invention is fitted to the patient by arranging the girdle 1 on the patient's pelvis and by coarsely adjusting the effective height of the extended members 201, 200 by means of the adjustment screw. Final adjustment is then effected by blowing compressed air into the pneumatic cushions 13, 14 by means of the pump 17, so as to effect a steady traction on the head, which traction is of course transmitted to the spine.

The axis of articulation X-X, about which the head supporting structure 10 may move, approximately coincides with the natural axis of nodding movement of the head with respect to the spine. Thus, flexo-extension of the head on the spine leaves unaffected the traction being exerted on the spine in an upward direction. Such movement of the head therefore causes no discomfort to the patient.

An alternative arrangement traction can be effected, instead of with the said pneumatic cushions, by means of a pneumatic cylinder fitted to the pelvic girdle and arranged to urge the tractor structure 2 upwards. As a further alternative it may be effected by instead associating a cylinder of the abovementioned type with the chin and occipital bone supporting pads.

Any of the various apparatus described above can furthermore be provided with special plates for effecting the correction of particular deformities, each said special plate comprising a strap 19 (Fig. 1) secured to the tractor structure 2 and carrying a shaped supporting plate 20 which is fitted with a pneumatic cushion 21 connected by a pipe to the air pump. In this way it is possible to exert an adjustable pressure on a selected zone.

If desired, and in accordance with a preferred feature of the invention, means may be provided at the top of the tractor structure 2 for enabling the patient to rotate his head about a vertical axis. Such a means, which is diagrammatically shown in Fig. 4, comprises a substantially semi-circular supporting member 23 which is secured to the top of the upper rod parts 2c, 2d of the structure 2. As shown, the supporting member 23 is provided with rollers 24 which permit the free rotation thereof, of a member 25 of similar configuration to the member 23, which member 25 overlies the member 23 which the interposition of the said rollers. The latter

member 25 is thus capable of angular displacements. As is also shown, member 25 is provided with straps 8', to which the head supporting structure is articulated, the latter structure being thus also capable of performing movements about the horizontal axis X-X.

As will be evident from the above description, the use of an orthopaedic apparatus according to the invention will allow of a steady traction on the spine while leaving ample freedom of movement of the head about a vertical and a horizontal axis. The support given by the pneumatic cushions makes the apparatus relatively comfortable to wear, and corrective effects may be obtained which are generally superior to those obtainable with known apparatus of the same type.

#### 20 WHAT WE CLAIM IS:—

1. Orthopaedic apparatus for effecting traction of a human spine, comprising the combination of a pelvic girdle, anatomically shaped to bear on the body projections of the pelvis of a patient, and a tractor structure, the said tractor structure comprising two shaped members which extend over and up the patient's back to carry a head-supporting structure, pneumatic means being provided and arranged to tension the tractor structure between the patient's pelvic girdle and the chin and occipital regions of the patient's head.

2. Apparatus as claimed in claim 1, wherein the said extended members project one to each side of the patient's head.

3. Apparatus as claimed in claim 1 or claim 2, wherein the said pneumatic means comprises two pneumatic cushions arranged one each on two supporting plates which are carried by the extended members and which are situated beneath the occipital and chin regions of the patient, the said cushions being connected with a device by means of which air under pressure may be introduced therein.

4. Apparatus as claimed in claim 1 or 2, wherein the said pneumatic means comprises a pneumatic cylinder situated at the bottom of the tractor structure and bearing on the pelvic girdle.

5. Apparatus as claimed in claim 1 or 2, wherein the said pneumatic means comprises a pneumatic cylinder in combination with two pneumatic cushions.

6. Apparatus as claimed in any of the preceding claims, wherein coarse screw adjustment means are provided between the girdle and tractor structure.

7. Apparatus as claimed in any of the preceding claims, wherein the head supporting structure is articulatable about a horizontal axis.

8. Apparatus as claimed in any of the preceding claims, wherein the head supporting structure is articulatable about a vertical axis.

9. Apparatus as claimed in claim 8, wherein the vertical articulation is provided by rollers interposed between two parts of the head-supporting structure, the said rollers being free to roll about horizontal axes.

10. Apparatus as claimed in any of the preceding claims, wherein the tractor structure is provided with special corrective plates fitted with pneumatic cushions for exerting an adjustable pressure on a predetermined body region.

11. Orthopaedic apparatus substantially as described herein with reference to Figs. 1, 2 and 3 of the accompanying drawings.

12. Orthopaedic apparatus substantially as described herein with reference to Figs. 1, 2 and 3 of the accompanying drawings when modified in accordance with Fig. 4 thereof.

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